

Space Evaporator-Absorber-Radiator (SEAR)

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A system for non-venting thermal control for spacesuits was built by integrating two previously developed technologies, namely NASA's Spacesuit Water Membrane Evaporator (SWME), and Creare's flexible version of the Lithium Chloride Absorber Radiator (LCAR). This SEAR system was tested in relevant thermal vacuum conditions. These tests show that a 1 m² radiator having about three times as much absorption media as in the test article would be required to support a 7 hour spacewalk. The serial flow arrangement of the LCAR of the flexible version proved to be inefficient for venting non-condensable gas (NCG). A different LCAR packaging arrangement was conceived wherein the Portable Life Support System (PLSS) housing would be made with a high-strength carbon fiber composite honeycomb, the cells of which would be filled with the chemical absorption media. This new packaging reduces the mass and volume impact of the SEAR on the Portable Life Support System (PLSS) compared to the flexible design. A 0.2 m² panel with flight-like honeycomb geometry is being constructed and will be tested in thermal and thermal vacuum conditions. Design analyses forecast improved system performance and improved NCG control. A flight-like regeneration system also is also being built and tested. Design analyses for the structurally integrated prototype as well as the earlier test data show that SEAR is not only practical for spacesuits but also has useful applications in spacecraft thermal control.